IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Carmeli et al.**	§	Group Art Unit: **2153**
	§	
Serial No. **10/713,956**	§	Examiner: **Phan, Tuankhanh D.**
	§	
Filed: **November 13, 2003**	§	Attorney Docket No.: **GB920020070US1**
	§	
For: **Liveness Monitoring in a**	§	Confirmation No: **7288**
Publish/Subscribe Messaging System	§	

35525

PATENT TRADEMARK OFFICE
CUSTOMER NUMBER

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF (37 C.F.R. 41.37)

This brief is in furtherance of the Notice of Appeal, filed in this case on January 30, 2008.

A fee of $510.00 is required for filing an Appeal Brief. No additional fees are believed to be necessary. If, however, any additional fees are required, I authorize the Commissioner to charge these fees which may be required to Yee & Associates Deposit Account No. 50-3157.

A one month extension of time is believed to be necessary. I authorize the Commissioner to charge the one month extension fee of $120.00 to Yee & Associates Deposit Account No. 50-3157. No additional extension of time is believed to be necessary. If, however, an additional extension of time is required, the extension is requested, and I authorize the Commissioner to charge any fees for this extension to Yee & Associates Deposit Account No. 50-3157.

REAL PARTY IN INTEREST

The real party in interest in this appeal is the following party: International Business Machines Corporation of Armonk, New York.

RELATED APPEALS AND INTERFERENCES

This appeal has no related proceedings or interferences.

STATUS OF CLAIMS

A.   **TOTAL NUMBER OF CLAIMS IN APPLICATION**

The claims in the application are: 1-54

B.   **STATUS OF ALL THE CLAIMS IN APPLICATION**

Claims canceled: 33-35 and 52.

Claims withdrawn from consideration but not canceled: None.

Claims pending: 1-32, 36-51, 53 and 54.

Claims allowed: None.

Claims rejected: 1-32, 36-51, 53 and 54.

Claims objected to: None.

C.   **CLAIMS ON APPEAL**

The claims on appeal are: 1-32, 36-51, 53 and 54.

STATUS OF AMENDMENTS

No amendments were filed after the Final Office Action mailed October 31, 2007.

SUMMARY OF CLAIMED SUBJECT MATTER

A.   CLAIM 1 - INDEPENDENT

The subject matter of claim 1 is directed to a publish/subscribe messaging system (Fig. 1, specification page 8, lines 9-20). The system comprises at least one broker (Fig. 2, 110) and at least one subscriber (Fig. 2, 210) (specification, page 8, lines 22-31), wherein the at least one broker has means for sending a status request message (Fig. 3, 310; page 12, lines 15-24) to the at least one subscriber, means, responsive to each subscriber receiving the status request message from the at least one broker, for setting a timer for each subscriber of the at least one subscriber (specification, page 9, lines 1-9), and means, responsive to the timer expiring, for sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber (specification, lines 1-16).

B.   CLAIM 17 - INDEPENDENT

The subject matter of claim 17 is directed to a method for liveness monitoring (Fig. 3) in a publish/subscribe messaging system having at least one broker and at least one subscriber (Fig. 1), the method comprising: sending a status request message from the at least one broker to the at least one subscriber (Fig. 3, 310; specification, page 12, lines 15-25), responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber (Fig. 3, 320; specification, lines 1-3), and responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber (Fig. 3, 330; specification, lines 4-16).

C.   CLAIM 36 - INDEPENDENT

The subject matter of claim 36 is directed to a system for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers (Fig. 1), the system comprising: means, responsive to each subscriber receiving a status request message from the broker (Fig. 3, 310; page 12, lines 15-24), for setting a timer for each subscriber in the plurality of subscribers (specification, page 9, lines 1-9), and means, responsive to the timer expiring, for sending a multicast message claiming response to the broker

from a particular subscriber in the plurality of subscribers (specification, lines 1-16).

D.   CLAIM 44 - INDEPENDENT

The subject matter of claim 44 is directed to a method for indicating liveness to a broker in a multicast publish/subscribe messaging system (specification, abstract) comprising the broker and a plurality of subscribers (Fig. 3), the method comprising: responsive to each subscriber receiving a status request message from the broker (Fig. 3, 310; specification, page 12, lines 15-25), setting a timer for each subscriber in the plurality of subscribers (Fig. 3, 320; specification, lines 1-3), and responsive to the timer expiring, sending a multicast message claiming response to the broker from a particular subscriber in the plurality of subscribers (Fig. 3, 330; specification, lines 4-16).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to review on appeal are as follows:

A.   GROUND OF REJECTION

Whether Claims 1-32, 36-51, 53 and 54 fail to be anticipated under 35 U.S.C. § 102 by *Sun*, <u>Reliable Multicast for Publish/Subscribe Systems</u>, Massachusetts Institute of Technology, May 2000.

ARGUMENT

A. SUMMARY OF ARGUMENT

The Office Action contends that *Sun* teaches expiration of a timer, as claimed. This assertion is fundamentally incorrect. *Sun* does not teach a timer, but rather teaches a time period in execution. Thus, *Sun* does not teach, "responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber," and "responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber," as required by the claims. Accordingly, the rejection is incorrect and should be reversed.

B. GROUND OF REJECTION (Claims 1-32, 36-51, 53 and 54)

I. The Rejection of Claims 1-32, 36-51, 53 and 54 Under 35 U.S.C. § 102 (b) Constitutes Factual and Legal Error

The sole ground of rejection in this appeal asserts that Claims 1-32, 36-51, 53 and 54 are anticipated under 35 U.S.C. § 102 (b) by *Sun* ("Reliable Multicast for Publish/Subscribe Systems"). This rejection is erroneous and therefore should be reversed. Claim 17 is representative of this grouping of claims and is reproduced, *infra*:

> 17.   A method for liveness monitoring in a publish/subscribe messaging system having at least one broker and at least one subscriber, the method comprising:
>   sending a status request message from the at least one broker to the at least one subscriber,
>   responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber, and
>   responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber.

The Office Action rejects Claim 17 asserting:

> Sun anticipates a publish/subscribe messaging system/method (abstract) comprising: wherein the at least one broker (Figure 3-1) has means

for sending a status request message (abstract) to the at least one subscriber (p. 14), means, responsive to each subscriber receiving the status request message from the at least one broker, fro setting a timer for each subscriber of the at least one subscriber, and means, responsive to the timer expiring, for sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber (pp. 30-31). *Final Office Action*, page 3.

Sun does not anticipate Claim 17 because *Sun* does not disclose each and every feature of Claim 17. For example:

Specifically . . . *Sun* fails to disclose the feature of responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber.

Appellants' Response to Office Action, page 17.

Responsive to this fact, the final Office Action states::

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e. responsive to the timer expiring) is read as existing a time t in the execution (p. 43, last para.) of gossiping for response message in Sun. *Final Office Action*, page 2, paragraph 3.

The Office Action's assertions are incorrect. *Sun* discloses a liveness condition monitoring protocol that uses a hybrid Publish/Subscribe messaging system that combines a logger based protocol with a gossip-based protocol. The hybrid protocol implements an acknowledgement system known as garbage collected notification rather that using timers and timeouts. However, contrary to the Office Action's assertion, nothing in *Sun* teaches or fairly suggests the use of timers. Indeed, the "time" that is referenced in *Sun* has no bearing on a timer expiration. Rather, the "time" in *Sun* refers to a time period in execution.

By contrast, Appellants claim, "responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber," and "responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber." These explicitly recited claim features require the use of a timer expiring, which is entirely distinct from the time in execution as disclosed in *Sun*.

Therefore, the attempt to map the elements of Appellants' claims, which include conditions that require the setting and expiration of a timer, to *Sun*, which has nothing to do with **timers,**

constitutes factual and legal error.. In fact, *Sun* does not teach these claimed features. Accordingly, under the standards of *In re Bond*, the cited reference does not anticipate claim 1 or any other claim in this grouping of claims. Therefore, the Board should reverse the rejection.

II.   Sun Does Not Anticipate Representative Claim 17

Anticipation under 35 U.S.C. § 102 requires that the prior art reference teach every element of the claim. For example, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Additionally, all limitations of the claimed invention must be considered when determining patentability. *In re Lowry*, 32 F. 3d 1579, 1582, 32 USPQ2d 1031, 1034 (Fed. Cir. 1994).

Specifically, nowhere in *Sun* is there a disclosure, either express or inherent, regarding Appellants' recited claim feature, "responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber." Nevertheless, the Office Action maps this recited claim limitation to *Sun* at page 43. The cited passage in *Sun* at page 43 states in pertinent part:

- *Property 4.1* For each missing message *m*, m is either recovered during the gossip phase or eventually passed on to the logger phase recovery.

    The first half of the claim is obvious from construction. To show the second half of the claim, we note that local garbage collection of *m* will eventually occur. In other words, ***there exists a time t in the execution*** such that $m \in gossipbuf_i$ for all *i* and time after t. ***Therefore, after time t, periodic gossip messages for retransmission of m will eventually result in the arrival of a corresponding GcNOTE message*** and removal of the ID from *gmissing* as desired. (emphasis added).

Sun does not mention a timer or the expiration of a timer, let alone the complete claim recitation of "responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber." Neither can the existence of a timer be inferred from the passage in *Sun* at page 43 as asserted in the final Office Action. "[A] time in the execution" refers to an execution time which is a point during the execution of a process or the amount of time that a process may take to complete a certain procedure. Similarly, "after time t_i" references a point in time and has nothing to do with the

expiration of a timer. Therefore, it appears that the Office Action has misconstrued the cited *Sun* passage.

Further, nowhere in *Sun* is there a disclosure, either express or inherent, of Appellant's recited claim limitation, "responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber." *Sun* does not include any disclosure regarding the setting of timers. Moreover, the Office Action has failed to treat this recited claim limitation. Nowhere in *Sun* does there exist a disclosure regarding the setting of a timer, let alone Appellants' recited conditional claim limitation of, "responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber."

Therefore, *Sun* does not anticipate Appellants' representative Claim 17. Independent Claims 1, 36, and 44 include the same limitations of "setting a timer" and "responsive to the timer expiring" as Claim 17. Therefore, Appellants contend that the same arguments are applicable and, accordingly, *Sun* cannot anticipate Claims 1, 36 and 44 either. Dependent Claims 2-32, 37-43, 45-51, 53 and 54 are also not anticipated by *Sun*.

III. *Sun* Does Not Anticipate Claims 5, 8, 21, 24, 39, 41, 47, and 49

Additionally, *Sun* does not anticipate claim claims 5, 8, 21, 24, 39, 41, 47, and 49. Claim 21 is a representative claim of this grouping of claims. Claim 21 is as follows:

> 21. The method of claim 20, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the suppressing further comprises:
> responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, cancelling the timer and discarding the status request message for the another subscriber.

Claim 21 depends from claim 17. Therefore, at least for the reasons given above, *Sun* also does not anticipate claim 21.

Furthermore, *Sun* does not teach the additional features of claim 21. The Examiner asserts otherwise, stating as follows:

> Regarding claims 5, 21, 39 and 47, Sun anticipates the publish/subscribe messaging system of claims 4, 20, 38, and 46 wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing sending (p. 15, lines 1-8;

Figure 3-3; p. 29, 72-3; p. 30) further comprise means, responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, for canceling the timer (p. 43) and discarding the status request message for the another subscriber (section 4.3; p. 40; p. 42).

Final Office Action of October 31, 2007, p. 4.

The portion of *Sun* cited by the Examiner is as follows:

> We generate a GcNOTE if and only if the requested message is not in our gossipbuf and that we have received the message before. This GcNOTE generation condition is true and sufficient for two reasons. First. Property 3.5 implies that we have received the message before, i.e. added to gossiphf. Second, gc is the only call that removes messages from gossiph f. Therefore, not in gossiph f implies local garbage collection has occurred.

> To ensure that rpbcast still satisfies our specification and liveness, we need to augment our simulation relation f to include gmissing as part of the missing message set. The remaining catch is to augment the liveness condition such that a message ID is eventually removed from gmissing:

> > Property 4.1 For each missing message m, is either recovered during the gossip phase or eventually passed on to the logger phase recovery.

> The first half of the claim is obvious from construction. To show the second half of the claim, we note that local garbage collection of m will eventually occur. In other words, there exists a time t in the execution such that m $\notin$ gossiphfi for all i and time after t. Therefore, after time t, periodic gossip messages for retransmission of m will eventually result in the arrival of a corresponding GcNOTE message and removal of the ID from gmissing as desired. Using Property **4.1** and the correctness of the logger based recovery shown in Chapter 3, we conclude rpbcast satisfies our specification and liveness condition in Section **2.1.** At this point, we have completed the description of our hybrid protocol rpbcast. We will now proceed to propose several "optimizations" and resolve some of the nagging details.

Sun, p. 43.

Sun teaches the condition upon which a GcNOTE (garbage collection notification) will be generated. *Sun* also states that this portion of *Sun* completes the description of hybrid protocol rpbcast. However, *Sun* is utterly devoid of *canceling* a timer, as asserted by the Examiner. The disclosure simply does not exist. Therefore, *Sun* does not anticipate claim 21 or any other claim in this grouping of claims.

Sun also does not teach canceling a timer *responsive to* the another subscriber of the least one subscriber receiving the multicast message claiming response. Thus, again, *Sun* does not anticipate claim 21 or any other claim in this grouping of claims.

Sun also does not teach, "discarding the status request message for the another subscriber," as required by claim 21. The Examiner asserts otherwise, citing the above portion of *Sun*. However, as shown above, page 42 of *Sun* has utterly nothing to do with this claimed feature. Nevertheless, the Examiner also cites the following portion of *Sun*:

> Our hybrid protocol, rpbcast, uses the same sender and logger modules as described in Section 3.1 and **3.2.** However, the receiver module in rpbcast is the combination in functionalities of the two receiver modules described in Section **3.3** and **4.1.** Luckily, the two receiver modules have very little overlap in their functionalities. The only overlap is adding a newly arrived message to deliver f. Therefore, the receiver module in rpbcast simply combines the two receiver modules into one big module. The only necessary addition to the big module is a mechanism for moving missing message IDS from gmissing (missing ID set in the gossip based recovery) to missing (missing ID set in the logger based recovery). when those messages can no longer be recovered through gossip phase. There are two simple solutions. The first solution just moves message IDS from gmissing to missing if the IDS have been in gmissing for a "long" time. This solution can be implemented by a receiver without knowing anything about the rest of the system. The drawback is that we always pay this time delay while an ID remains in gmissiny, even though gossip phase might have already failed to recover the message.
>
> Our second solution uses more feedback from the gossip phase. Instead of using a timeout, we ask our gossip target to generate a garbage collected notification whenever the target has already garbage collected the message from its yossiphf. This notification will alert the gossiper to move the missing message ID from gmissing to missing - in effect, send all future rcqlicsts directly to a logger. Figure **4-4** illustrates the use of garbage collected notification.
>
> When we gave an overview of our protocol in Section **2.2,** we mentioned that a protocol designer can "swap" in SRM for the gossip based recovery if he or she desires. This swapping is possible because of the lack of overlap in functionality between the two types of receiver nlodules. Therefore, as long as missing message IDS are eventually moved from the peer-based recovery to logger based recovery, the resulting protocol will still function correctly. However, some of the optimizations in Chapter 5 are designed specifically for gossip based recovery, thus may not be applicable if SRM is swapped in.

> We now give the I/O automaton description of the combined receiver
> module in rpbcast that utilizes both gossip and logger recovery with the
> garbage collection notification scheme. In this version, we grouped
> individual RTXs into one big message and send that message as our gossip.

Sun, p. 40, section 4.3

The cited portion of *Sun* teaches two solutions to a mechanism for moving missing message IDS from gmissing to missing when those messages can no longer be recovered through gossip phase. The first solution is to move message IDS from gmissing to missing if the IDS have been in gmissing for a "long time." The second solution avoids a timer by using a feedback from the gossip phase.

However, the Examiner's contention that this disclosure teaches, "responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, cancelling the timer and discarding the status request message for the another subscriber," is plainly wrong on the face of *Sun's* disclosure. Even if the "moving" of message IDS were "discarding" as claimed, and after a "long time" in *Sun* were considered a timer, the timer is not canceled. Although the timer might be considered expired (a point disputed by Appellants, at least vis-à-vis the nature of the claimed timer in claim 17), the timer is not _canceled_. Additionally, *Sun* does not teach that the cancelling or discarding is performed "responsive to the another subscriber of the at least one subscriber receiving the multicast message claiming response."

In short, *Sun* simply does not teach what the Examiner asserts *Sun* to teach. In fact, *Sun* does not teach the features of the claims. Therefore, *Sun* does not anticipate claim 5 or any other claim.

C.   CONCLUSION

Based on the foregoing, the Office Action rejection under 35 U.S.C. § 102 (b) of Claims 1-32, 36-51, 53 and 54 is substantively and legally erroneous. Therefore, Appellants respectfully request that the Board of Patent Appeals and Interferences reverse the rejection under 35 U.S.C. § 102(b) so that an allowance of this application may be entered.

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CLAIMS APPENDIX

The text of the claims involved in the appeal is as follows:

1.   A publish/subscribe messaging system, comprising:

at least one broker and at least one subscriber, wherein the at least one broker has means

for sending a status request message to the at least one subscriber, means, responsive to each

subscriber receiving the status request message from the at least one broker, for setting a timer

for each subscriber of the at least one subscriber, and

means, responsive to the timer expiring, for sending a multicast message claiming

response to the at least one broker from a particular subscriber of the at least one subscriber.

2.   The publish/subscribe messaging system of claim 1, further comprising:

means for sending a status response message from the particular subscriber to the at least

one broker, wherein the status response message is an indication of liveness of the at least one

subscriber.

3.   The publish/subscribe messaging system of claim 1, further comprising:

means for listening on a multicast channel by the at least one broker, and

means for determining an indication of non-liveness from failure to receive a response

from the at least one subscriber.

4.   The publish/subscribe messaging system of claim 2, wherein the means for sending the status response message from the particular subscriber to the at least one broker further comprises:

     means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber of the at least one subscriber.

5.   The publish/subscribe messaging system of claim 4, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing further comprises:

     means, responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, for cancelling the timer and discarding the status request message for the another subscriber.

6.   The publish/subscribe messaging system of claim 5, further comprising:

     means, responsive to the at least one broker failing to receive the multicast message claiming response from the at least one subscriber, for re-sending the status request message

7.   The publish/subscribe messaging system of claim 4, wherein the means for suppressing further comprises:

     means, responsive to a desired plurality of subscribers of the at least one subscriber sending the status response message, for suppressing sending of the separate status response message from the another subscriber.

8.   The publish/subscribe messaging system of claim 7, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing sending of the separate status response message from the another subscriber further comprises:

means, responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, for cancelling the timer and discarding the status request message for the another particular subscriber.

9.   The publish/subscribe messaging system of claim 1, wherein the timer has a random duration.

10.   The publish/subscribe messaging system of claim 1, further comprising

means for maintaining an active connection between the particular subscriber and the at least one broker, wherein the active connection is established during registration, and

means for indicating liveness to the at least one broker using

11.   The publish/subscribe messaging system of claim 10, further comprising:

means for sending a status response message from the particular subscriber to the at least one broker to indicate the liveness, means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber, and wherein the means for suppressing further comprises:

means, responsive to determining that the particular subscriber has the active connection to the at

least one broker, for performing one of sending the status response message to the at least one

broker via the active connection, and sending the multicast message claiming response and the

status response message to the at least one broker via the active connection upon expiry of the

timer.

12.   The publish/subscribe messaging system according to claim 1, wherein the at least one

broker is arranged to designate a first subscriber to register interest in a topic as a primary

subscriber, and to maintain an active connection to the primary subscriber for sending the status

request message directly to the primary subscriber, and to designate a different subscriber as a

new primary subscriber in response to a failure of the primary subscriber to send an indication of

liveness and in response to the different subscriber sending the indication of liveness.

13.   The publish/subscribe messaging system of claim 10, wherein the active connection is a

transmission control protocol/internet protocol connection.

14.   The publish/subscribe messaging system of claim 1, wherein the status request message is

piggybacked onto another multicast publication message.

15.   (The publish/subscribe messaging system of claim 2, wherein the indication of liveness is

sent over one of a user datagram protocol connection; and a transmission control protocol

connection.

16.   The publish/subscribe messaging system of claim 15, wherein a connection over which the indication of liveness is sent is arranged to escalate autonomously from the user datagram protocol connection to the transmission control protocol connection in response to an absence of responses to the at least one broker within a chosen time period.

17.   A method for liveness monitoring in a publish/subscribe messaging system having at least one broker and at least one subscriber, the method comprising:

sending a status request message from the at least one broker to the at least one subscriber,

responsive to each subscriber receiving the status request message from the at least one broker, setting a timer for each subscriber of the at least one subscriber, and

responsive to the timer expiring, sending a multicast message claiming response to the at least one broker from a particular subscriber of the at least one subscriber.

18.   The method of claim 17, further comprising:

sending a status response message from the particular subscriber to the at least one broker, wherein the status response message is an indication of liveness of the at least one subscriber.

19.   The method of claim 17, further comprising:

listening on a multicast channel by the at least one broker, and

determining an indication of non-liveness from failure to receive a response from the at least one subscriber.

20.   The method of claim 18, wherein sending the status response message from the particular subscriber to the at least one broker further comprises:

responsive to the particular subscriber sending the status response message, suppressing sending of a separate status response message from another subscriber of the at least one subscriber.

21.   The method of claim 20, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the suppressing further comprises:

responsive to the another subscriber of the least one subscriber receiving the multicast message claiming response, cancelling the timer and discarding the status request message for the another subscriber

22.   The method of claim 21, further comprising:

responsive to the at least one broker failing to receive the multicast message claiming response from the at least one subscriber, re-sending the status request message

23.   The method of claim 20, wherein the suppressing further comprises:

responsive to a desired plurality of subscribers of the at least one subscriber sending the status response message, suppressing sending of the separate status response message from the another subscriber.

24.   The method of claim 23, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein suppressing sending of the separate status response message from the another subscriber further comprises:

responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, cancelling the timer and discarding the status request message for the another particular subscriber.

25.   The method of claim 17, wherein the timer has a random duration.

26.   The method of claim 17, further comprising:

maintaining an active connection between the particular subscriber and the at least one broker, wherein the active connection is established during registration,

indicating liveness to the at least one broker using the active connection.

27.   The method of claim 26, further comprising:

sending a status response message from the particular subscriber to the at least one broker to indicate the liveness, responsive to the particular subscriber sending the status response message, suppressing sending of a separate status response message from another subscriber of the at least one subscriber, and wherein the suppressing further comprises:

responsive to determining that the particular subscriber has the active connection to the at least one broker, performing one of sending the status response message to the at least one broker

via the active; connection, and sending the multicast message claiming response and the status response message to the at least one broker via the active; connection upon expiry of the timer.

28.   The method of claim 17, further comprising:

a first subscriber of the at least one subscriber to register interest in a topic as a primary subscriber,

maintaining an active connection to the primary subscriber for sending the status request message directly to the primary subscriber, and responsive to a failure of the primary subscriber to send an indication of liveness and responsive to a different subscriber of the at least one subscriber sending the indication of liveness, designating the different subscriber as a new primary subscriber.

29.   The method of claim 26, wherein the active connection is a transmission control protocol/internet protocol connection.

30.   The method of claim 17, wherein the status request message is piggybacked onto another multicast publication message.

31.   The method of claim 18, wherein the indication of liveness is sent over one of a user datagram protocol connection and a transmission control protocol connection.

32.   The method of claim 31, wherein a connection over which the indication of liveness is sent escalates autonomously from the user datagram protocol connection to the transmission

control protocol connection in response to an absence of responses to the at least one broker within a chosen time period.

36.   A system for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the system comprising:

means, responsive to each subscriber receiving a status request message from the broker, for setting a timer for each subscriber in the plurality of subscribers, and

means, responsive to the timer expiring, for sending a multicast message claiming response to the broker from a particular subscriber in the plurality of subscribers.

37.   The system of claim 36, further comprising:

means for sending a status response message from the particular subscriber to the broker, wherein the status response message is an indication of liveness of the plurality of subscribers.

38.   The system of claim 37, further comprising:

means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber in the plurality of subscribers.

39.   The system of claim 38, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing further comprises:

means, responsive to the another subscriber in the plurality of subscribers receiving the multicast message claiming response, for cancelling the timer and discarding the status request message for the another subscriber.

40. The system of claim 38, wherein the means for suppressing further comprises:

means, responsive to a desired plurality of subscribers of the at least one subscriber sending the status response message, for suppressing sending of the separate status response message from the another subscriber.

41. The system of claim 40, wherein the status request message comprises a parameter representative of the desired plurality of subscribers, wherein sending the status response message is responsive to sending the multicast message claiming response, and wherein the means for suppressing sending of the separate status response message from the another subscriber further comprises:

means, responsive to the another particular subscriber receiving the multicast message claiming response from the desired plurality of subscribers, for cancelling the timer and discarding the status request message for the another particular subscriber.

42. The system of claim 36, further comprising:

means for maintaining an active connection between the particular subscriber and the broker, wherein the active connection is established during registration, means for indicating liveness to the broker using the active connection.

43.   The system of claim 36, further comprising:

means for sending a status response message from the particular subscriber to the broker to indicate liveness, means, responsive to the particular subscriber sending the status response message, for suppressing sending of a separate status response message from another subscriber, and further comprises:

means, responsive to determining that the particular subscriber has an active connection to the broker, for performing one of sending the status response message to the broker via the active connection, and sending the multicast message claiming response and the status response message to the broker via the active connection upon expiry of the timer.

44.   A method for indicating liveness to a broker in a multicast publish/subscribe messaging system comprising the broker and a plurality of subscribers, the method comprising:

responsive to each subscriber receiving a status request message from the broker, setting a timer for each subscriber in the plurality of subscribers, and responsive to the timer expiring, sending a multicast message claiming response to the broker from a particular subscriber in the plurality of subscribers.

45.   The method of claim 44, further comprising:

sending a status response message from the particular subscriber to the broker, wherein the status response message is an indication of liveness of the plurality of subscribers.

46.   The method of claim 45, comprising:

responsive to the particular subscriber sending the status response message, suppressing

sending of a separate status response message from another subscriber in the plurality of

subscribers.

47.   The method of claim 46, wherein sending the status response message is responsive to

sending the multicast message claiming response, and wherein the suppressing further comprises:

responsive to the another subscriber receiving the multicast message claiming response,

cancelling the timer and discarding the status request message for the another subscriber.

48.   The method of claim 46, wherein the suppressing further comprises:

responsive to a desired plurality of subscribers of the plurality of subscribers sending the

status response message, suppressing sending of the separate status response message from the

another subscriber.

49.   The method of claim 48, wherein the status request message comprises a parameter

representative of the desired plurality of subscribers, wherein sending the status response

message is responsive to sending the multicast message claiming response, and wherein

suppressing sending of the separate status response message from the another subscriber further

comprises:

responsive to the another particular subscriber receiving the multicast message claiming

response from the desired plurality of subscribers, cancelling the timer and discarding the status

request message for the another particular subscriber.

50.   The method of claim 44, further comprising:

maintaining an active connection between the particular subscriber and the broker, wherein the active connection is established during registration, and

indicating liveness to the broker using the active connection.

51.   The method of claim 50, further comprising:

sending a status response message from the particular subscriber to the broker to indicate the liveness, responsive to the particular subscriber sending the status response message, suppressing sending of a separate status response message from another subscriber, and wherein the suppressing further comprises:

responsive to determining that the particular subscriber has the active connection to the broker, performing one of sending the status response message to the broker via the active connection, and sending the multicast message claiming response and the status response message to the broker via the active connection upon expiry of the timer.

53.   The method of claim 17, further comprising:

responsive to sending the multicast message claiming response and responsive to an absence of an active connection between the particular subscriber and the at least one broker,

establishing the active connection to the at least one broker and sending a status response message to the at least one broker via the active connection.

54.   The publish/subscribe messaging system of claim 1, further comprising:

responsive to sending the multicast message claiming response and responsive to an

absence of an active connection between the particular subscriber and the at least one broker,

establishing the active connection to the at least one broker and sending a status response

message to the at least one broker via the active connection.

EVIDENCE APPENDIX

This appeal brief presents no additional evidence.

RELATED PROCEEDINGS APPENDIX

This appeal has no related proceedings.